WICONISCO CANAL, AQUEDUCT No. 3
(Inglenook Aqueduct)
Pennsylvania Historic Bridges Recording Project - II
Spanning Powell Creek at State Rt. 147
Halifax vic.
Dauphin County
Pennsylvania

HAER No. PA-496

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
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Location:	Spanning Powell Creek at State Rt. 147, Halifax vicinity, Dauphin County, Pennsylvania.
USGS Quadrangle:	Halifax, Pennsylvania (7.5-minute series, 1977).
UTM Coordinates:	18/331600/4474920
Dates of Construction:	1838-40.
Designer:	John P. Bailey and William R. Harrison, engineers, Wiconisco Canal.
Builder:	George Mish and Company.
Present Owner:	Pennsylvania Department of Transportation.
Present Use:	Vehicular bridge.
Significance:	Originally a component of the Pennsylvania Canal system, this aqueduct was the largest bridge on the state-initiated and privately completed Wiconisco Canal. Hewn from the foot of Peter's Mountain where it forms the eastern bank of the Susquehanna River, the canal facilitated the transportation of coal from the anthracite fields of northern Dauphin County southward to the East Branch Canal through Harrisburg, and thence to points east. Continual use of the structure over Powell Creek as a highway bridge serves as lasting testament to the continuity of routes enforced by the mountainous geography of central Pennsylvania. Because of its diverse roles in Pennsylvania's transportation heritage, this structure was listed on the National Register of Historic Places in 1988.
Historian:	Ben A. Shackleford, August 1998.
Project Description:	The Pennsylvania Historic Bridges Recording Project II was co-sponsored during the summer of 1998 by HABS/HAER under the general direction of E. Blaine Cliver, Chief; the Pennsylvania

Department of Transportation, Bureau of Environmental Quality, Wayne W. Kober, Director; and the Pennsylvania Historical and Museum Commission, Brent D. Glass, Executive Director and State Historic Preservation Officer. The fieldwork, measured drawings, historical reports and photographs were prepared under the direction of Eric DeLony, Chief of HAER.

Introduction

Wiconisco Canal Aqueduct No. 3 now carries Pennsylvania State Route 147 over Powell Creek. Completed circa 1840, the masonry aqueduct formed the southernmost passage of the canal over waterways feeding under the canal into the Susquehanna.[1] The continued use of this structure for vehicular passage over Powell Creek exemplifies the permanence of mid-nineteenth century stone construction and the artful solidity of Pennsylvania craftsmanship. It also forms an important link in the history of transportation within Pennsylvania, as a transportation structure that has defied changes in vehicular traffic. Its fundamental importance and size reflect the expense and achievement of nineteenth-century anthracite coal extraction in east central Pennsylvania's Lykens Valley.[2] Continued use of Aqueduct No. 3 as a crossing of Powell Creek defines a transportation corridor whose use stretches from a pre-colonial footpath to a contemporary highway.

Description

The Wiconisco Canal follows the contour of the Susquehanna as it winds southward toward Harrisburg. The riparian terrain of Inglenook forms but a narrow ledge of soil between the river and the towering mass of Peter's Mountain. Flowing across the mountain and the alluvial ribbon, Powell Creek has carved Powell's Valley and a stream bed down to the Susquehanna from the solid rock of northern Dauphin County. From and upon this rock, the edifices of the Wiconisco Canal were built.

The aqueduct consists of three stone arches, each approximately 24'-0" in span. Including the piers and abutments, the structure bridges a total distance of about 80'-0".[3] Its arches, parapets, and wing walls are built of quarried and cut, hammer-dressed mixed red and white coursed ashlar. The wing walls are stepped, curving from the abutting earth at an angle of 45

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[1] Wiconisco Canal, Engineering Accounts, Estimates, and Work Receipts, 1838-1846, Record Group 17.365, Pennsylvania State Archives, Harrisburg, Pa. (hereinafter cited as Wiconisco Accounts).

[2] Robert McCullough and Walter Leuba, *The Pennsylvania Main Line Canal* (Martinsburg, Pa.: Morrisons Cove Herald, 1962), 78.

[3] Pennsylvania Department of Transportation, "Inspection Report," 1977, bridge inspection file, BMS No. 22-0147-0040-1898, PennDOT District 8-0, Harrisburg, Pa.

degrees for a distance of approximately 36'-6". Hammer-finished cut stone spandrel walls rest atop voussoirs consisting of larger, uniformly cut stones, fit with a uniform 3/8"-thick layer of mortar. The barrel of each arch consists of cut stone masonry set in a slightly elliptical form, following the outline of the voussoirs. Just above the crown of the arches, a belt course corresponds with what was likely once the bottom of timbers lining the canal. Above the arches and voussoirs, the parapets are topped with a smooth continuous coping of cut stone 3'-0" wide by 1'-0" thick. Built upon fill packed to the level of the coping, the current roadway consists of a two-lane asphalt highway set comfortably in the center of the 50'-0"-wide bridge. This southernmost and largest of three aqueducts, all constructed to similar specifications, in the 12.25-mile-long canal, continues to carry traffic along the east bank of the Susquehanna.

The Wiconisco Canal

The Wiconisco Canal was begun in 1837 as an extension of the Eastern Division of the Pennsylvania Canal.[4] Plans of the passage of the Eastern Division across the Susquehanna River at Clarks Ferry reveal that the Wiconisco feeder was intended as an addition as early as 1829. According to the design submitted by Samuel Kneass, engineer of the Eastern Division Canal, the guard locks and final set of descending locks of the Wiconisco were to be integrated with the northern entrance of the Eastern Division Canal at the Clarks Ferry crossing.[5] A dam at Clarks Ferry would provide depth sufficient for canal boats to navigate across the Susquehanna parallel to Clarks Ferry Bridge or enter and leave the Wiconisco feeder. From where the Susquehanna Canal crossed to the western bank of the river at Clarks Ferry, the Wiconisco feeder would follow the eastern bank for 12.25 miles. Probably because it constituted an ancillary section of the Pennsylvania Canal system, construction of the Wiconisco feeder was postponed until the Eastern Division was completed in 1837. Postponement had interesting consequences on the construction and life of the Wiconisco.

Following the completion of the Eastern Division, the construction supervisor of the closing stages of work around Harrisburg, John P. Rutherford, became the superintendent of construction for the Wiconisco feeder. Clearing work and construction contracts were immediately undertaken. The ledgers kept by Rutherford indicate that work on the canal continued from 1837 until 6 February 1839, becoming intermittent only during the winter months.[6] Besides administering and supervising the contracts, Rutherford was responsible for producing numerous batches of printed materials. Among these were standard work estimate contract forms used to determine the rates and compensation allowed contractors for work on various stages of the canal. Receipts from printers also reveal the commission of batches of

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[4] "Map of the Eastern Division Canal At Clarks Ferry," 1829, Map No. 20, Map Book 7, Pennsylvania State Archives, Harrisburg, Pa.

[5] "Map of the Eastern Division Canal."

[6] Wiconisco Accounts.

leaflets, bills, and broadsides meant to advertise the route of the canal to affected landowners, solicit construction bid submissions, and attract extra workers to the canal.[7] However, the most significant piece of printing compiled by Rutherford during the fall and winter of 1838 was the specification book for the Wiconisco Canal.

The "Rules and Specifications Relating to the Manner of Constructing the Work on the Wiconisco Canal" is a slim volume. For a contractor-craftsman it would have been essential to fully understand how the canal was to be built. Its detailed specifications, leaving hardly any room for error, speak of the costly lessons in shoddy workmanship learned during the early days of main-line canal construction.[8] It described the method and materials of construction for the canal bed itself, the guard locks, lift locks, foot bridges, towpaths, culverts, bridges, dams, and aqueducts of the Wiconisco. The specifications dictated that the "Aqueduct shall be built of stone, those forming arches shall be cut and laid in a neat and workmanlike manner, and the remainder to be hammer-dressed masonry, similar to lock masonry, and coped with cut stone."[9]

The specifications for the stonework reflect concern for economy, strength, and durability. For example, the close dressing of stones composing the arch ring would exclude stones with internal weaknesses from this most critical compression component of the bridge. Any flaws within the stone would become evident in the form of chips or fissures during the process of cutting and fitting. Yet, in order to minimize the cost of the aqueduct, the stones composing the walls were allowed a hammer finish. Such a finish would also, to a lesser degree, reveal unfit stones but cost less to complete. Details such as these indicate the author's or authors' familiarity with both engineering and construction practice. Though probably at least edited by John P. Bailey, chief engineer for the canal in 1838, this book seems to bear the mark of a pragmatic construction supervisor as well. The book of specifications persisted even as the positions of engineer and superintendent were refilled. It was released in 1839, soon after changes in the offices of Superintendent and Engineer distanced Rutherford and Bailey from the project.

The changes were likely a consequence of politics downstream in Harrisburg, where construction cost overruns and the canal system's debt combined with a currency crisis fed by state debt. Continually mounting expenditures on a new portion of a canal system that could not support itself likely prompted much discussion.[10] Probably as a consequence, the canal commissioners replaced Rutherford as superintendent and Bailey as head engineer during the spring of 1839.[11]

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[7] Wiconisco Accounts.

[8] McCullough and Leuba, *The Pennsylvania Main Line Canal,* 152-5.

[9] Wiconisco Accounts.

[10] Alvin F. Harlow, *Old Towpaths* (New York: D. Appleton & Co., 1926).

[11] Wiconisco Accounts.

Construction of the canal continued soon after the installation of Simon Sallade as Superintendent on 26 March 1839. By April, new contracts had been agreed upon and state appropriations were again rolling in to pay for the work. The neater books kept by Sallade seem to indicate his greater concern for the amount of money being spent on the project, as do estimates that accompanied his appointment, and frequent correspondence directly between Sallade and the board of commissioners to obtain approval for incidental expenses.[12] Despite tight finances, work on the canal continued.

To facilitate management of canal construction, the 12.25 miles of its length were divided into twenty-five sections of forty chains each. The plans for the canal as executed by Sallade were presumably the same as those used by Rutherford. Sallade's plans for the Wiconisco included one feeder dam across Wiconisco Creek at Millersburg, the northern end of the canal, from which a guard lock and sections 1 through 8 led southward. The canal crossed Aqueduct No. 1 into sections 9 and 10 downstream, across Aqueduct No. 2, and thence through section 11 into Lift Lock No. 1. From the first lock, water and cargo flowed south through sections 12 through 16 into Lift Lock No. 2, then on to sections 17 through 22. Aqueduct No. 3 received the flow from section 22, moving it southward into section 23 and thence into Lift Locks No. 3 through No. 6, and sections 24 and 25 to Clarks Ferry. Ancillary structures — locks, dams, and aqueducts — were each put out for construction bids separate from work on the canal itself. Thus the narrow guard locks to prevent the river from inundating the system at high water, aqueducts to carry the canal over obstacles such as streams, and locks to adjust the level of canal boats each bore a finish unique to the craftsmen or contractors who completed each structure.

As a feeder canal, the Wiconisco tied the Lykens Valley coal fields of northern Dauphin County with an increasingly integrated transportation system. The Susquehanna Canal composed the central trunk of the Pennsylvania Canal system, linking Williamsport and Bellefonte via the West Branch Canal, and Carbondale and Scranton along the North Branch. Connecting with the southern portion of the Susquehanna Canal, the Union Canal carried goods east to Reading and thence to Philadelphia via the Schuylkill Canal.[13]

Construction of Wiconisco Canal Aqueduct No. 3

Aqueduct No. 3 represents the method and manner of construction at the epoch of canal engineering expertise. Begun in 1838, it required over three years of effort and the services of three contractors to reach completion. In 1838, estimates for materials and construction for Aqueduct No. 3 ranged from $6,246 to $6,957. Included in the estimates are 1,500 perches of masonry for a total of $5,250, which hint at the origin of the aqueduct's design.[14] The masons building the bridge were to be paid according to a masonry estimate, not for a completed

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[12] Wiconisco Accounts.

[13] Harlow, *Old Towpaths*, 129.

[14] Wiconisco Accounts.

structure. This pricing system indicates that the contractor or possibly a master mason would not be building a bridge according to his own design, but rather one created or at least approved by Bailey, lead engineer of the canal in 1838.

The cost estimates also reveal something of the premium placed on masons' skills. Whereas loose stone removal paid twenty-eight cents per cubic yard, cutting solid rock to create space for the canal bed paid fifty cents per cubic yard, and quarrying paid twice that, fitting and mortaring stone blocks into a bridge paid more than triple the cost of quarrying.[15] Clearly, the skills required to build a structure such as Aqueduct No. 3 were highly valued during the mid-nineteenth century.

The initial contractors, William and J. C. Corbett, began work in the fall of 1838 and were paid for delivering 600 perches of quarried stone to the site of Aqueduct No. 3 on the first of December. For the effort of quarrying and delivering each perch of cut stone, a cubic stack of stone measuring roughly three feet on each side, the contractors were paid one dollar.[16] This stone sat unused along the banks of Powell Creek until the summer of 1839. A managerial shake-up resulting from state-wide discontent about canal expenditures halted work on the canal. The installation of Sallade as Superintendent of the Wiconisco Canal in March 1839 indicates the canal commissioners' dissatisfaction with his predecessor's performance, likely because of the ballooning cost of canal construction.

The inclusion of excavation, carpentry, and the delivery of different materials at various stages of construction hint at the management challenge faced by a contractor. Given these difficulties, it is easy to see how canal construction ran over budget. Estimates recorded a need for 6,100 board-feet of sound hemlock timber at $91.50 and 10,800 board-feet of hemlock planks at $129.60. (Hemlock was commonly used in applications where rot resistance was essential.) The timber became the temporary centering used to support the arches as they were built, and the finished planks formed the floor and sides of the water trough. Miscellaneous iron work at $225 fastened the wooden canal floor planks to each other and to the masonry. Carpentry expenses of $200, and excavation and embankment costs of $350 filled out the estimate.[17]

Beginning some time in the late summer of 1839, George Mish and Company, presumably a stone masonry contracting firm, resumed construction of the final section of the Wiconisco feeder. Aqueduct No. 3 was the only masonry project on the canal undertaken by Mish. His task involved coordinating the work of disparate groups of skilled artisans and laborers, as well as the delivery of different materials to a remote work site without easy transport. Nonetheless, receipts for work completed roughly every month except December, January, and February — when the bitter chill of winter along the Susquehanna no doubt limited construction time — were fairly consistent and seem to demonstrate a well-managed work site.

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[15] Wiconisco Accounts.

[16] Wiconisco Accounts.

[17] Wiconisco Accounts.

The final cost of the structure amounted to $9700.50, a figure which exceeded the 1838 estimates by more than half.[18] Though completed in 1840, the Wiconisco Aqueduct No. 3 carried neither water nor freight until completion of the canal by private concerns in 1844.

Private Ownership

The state was forced to discontinue expenditures for canal construction after February 1841.[19] Due to currency depreciation brought on by the panics of 1837 and 1839, Pennsylvania defaulted on its debt payments. As expenses for the canal system were a major component of the debt, the state legislature was unwilling to devote any more money to its construction.[20] On 13 July 1842, the state legislature incorporated the Wiconisco Canal Company.[21] This private entity was to complete the canal and put it into operation within three years. A brief summary of the construction history included in the 1863 report of the canal commissioners reveals that "The actual cost of the canal is about 450,000. The state expended about $390,000 on it and and left it in an unfinished state, and would make no further appropriations for its completion. The legislature in 1844 incorporated this Company and released all ownership in the canal, investing the same in this Company."[22]

Edward Gratz was majority stockholder among those who took control of the Wiconisco's assets in 1845.[23] The Canal continued operation under the management of Gratz and associates throughout the 1850s and 1860s. According to reports to the Auditor General, the Wiconisco Canal carried 80,000 to 90,000 tons of anthracite coal annually throughout its history.[24] Timber from Lykens Valley — oak, pine, and hemlock — comprised much of the remaining cargo. Yet the main business of the Wiconisco was coal. Timber freight combined with agricultural products, furniture, building materials, and miscellaneous items seldom represented more than a small fraction of the canal's total tonnage. In 1870, the Wiconisco

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[18] Addition of ledger entries of payments to George Mish and Company, from Wiconisco Accounts.

[19] Carter Goodrich, ed., *Canals and American Economic Development* (New York: Columbia Univ. Press, 1961), 251; Harlow, *Old Towpaths,* 134-8.

[20] Harlow, *Old Towpaths.*

[21] Robert W. Keintz, "Wiconisco Canal Issue," *Canal Currents: Bulletin of the Pennsylvania Canal Society* (Spring 1988): 2.

[22] Reports to the canal commissioners beginning in 1863 chronicle year-to-year operation of the Wiconisco. See "Report to the Board of Canal Commissioners," 1863, Annual Reports of the Canal and Navigation Companies, Record Group 17.296, Pennsylvania State Archives, Harrisburg, Pa.

[23] "Letters Patent," 1845, Record Group 14, Pennsylvania State Archives, Harrisburg, Pa.

[24] "Report to the Board of Canal Commissioners," 1863; "Report to the Board of Canal Commissioners," 1867, Annual Reports of the Canal and Navigation Companies, Record Group 17.296, Pennsylvania State Archives, Harrisburg, Pa.

carried among its miscellaneous items 677.5 tons of railroad iron, likely sowing the seeds of its own eventual demise.[25]

Years of marginal returns and costly repairs meant but meager dividends for the original investors. As of 1870, construction and maintenance of the Wiconisco had cost an estimated $512,000. Of this amount, $122,000 had been supplied by Philadelphia investors in the Wiconisco Canal Company. Because yearly returns seldom exceeded $3,000, it is not surprising that in November 1871 control of the Wiconisco was taken over by the Pennsylvania Canal Company, a subsidiary of the Pennsylvania Railroad.[26]

Heavy coal traffic probably kept the Wiconisco functioning as a canal long after other, longer canals had ceased to function. For a heavy commodity like coal, with large quantities, predictable demand, and low margins, the low cost and relative slowness of canal boat operation could persist in competition with railroads. Mules were, after all, cheaper to fuel and maintain than even the smallest locomotive. Being captive to the coal fields of Lykens Valley helped the Wiconisco Canal endure the demise of many other state-operated canals.

Despite economic operation, the Wiconisco Canal could not withstand natural devastation. A flood in May 1889 destroyed much of the canal; it was closed in 1890 and not reopened.[27] Throughout much of the second half of the nineteenth century, Wiconisco Canal boats had carried coal southward to markets beyond Lykens Valley and Dauphin County. The structures that remained after the flood would, during the twentieth century, carry a different sort of vehicle southward along the banks of the Susquehanna.

Conclusion

Aqueduct No. 3 probably continued to carry traffic, albeit land-based vehicles rather than canal boats, over Powell Creek immediately after the canal's destruction in 1889. In the narrow passage between Peter's Mountain and the Susquehanna, north- and southbound traffic on the east bank had no other means of crossing the creek. A state road map from 1928 depicts the passage of Legislative Route No. 1 over the aqueduct.[28] Today, the road is known as State Route 147. Ironically, the very features of the structure that made it useful as a piece of canal architecture, its massive stone work and great width, allow it to easily carry the weight of modern traffic. Thus, from a steady flow of water to a steady stream of vehicles, the aqueduct built by George Mish and Company continues to carry traffic along the shore of the Susquehanna.

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[25] "Report to the Board of Canal Commissioners," 1870, Annual Reports of the Canal and Navigation Companies, Record Group 17.296, Pennsylvania State Archives, Harrisburg, Pa.

[26] Keintz, "Wiconisco Canal Issue," 2-3.

[27] Keintz, "Wiconisco Canal Issue," 3; "The Recent Great Flood," *Harrisburg Patriot,* 16 Aug. 1889.

[28] Pennsylvania Department of Highways, *Pennsylvania State Highway Map* (Harrisburg: Pennsylvania Department of Highways, 1928).

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